

I can do maths too

— Count me in!

Some years ago, a friend of mine was telling me about her daughter who has cerebral palsy. When she was in Year 7, the class teacher commented they would need to teach her to type because she would not be able to handwrite fast enough at university. This was a significant moment for my friend as at the time, university entry by people with disabilities was not common.

Since the early 1980s, it has become increasingly common for children with special needs to be included in regular classrooms. This paper will consider a rationale for inclusion, discuss potential sources of difficulty with mathematics and suggest strategies to help teachers effectively manage the learning of students in their mathematics classes.

Terminology

Before we consider how to help children with special needs, a comment on correct use of terminology is important — not just for political correctness, but for the potential role for teachers.

The World Health Organisation has defined the terms 'impairment', 'disability' and 'handicap' to have specific and separate meanings. (These are currently under review, perhaps moving from the current definitional emphasis on a medical model).

Impairment — an abnormality in the way organs or systems function, usually of medical origin, for example, short-sightedness, heart problems, cerebral palsy, Down syndrome, spina bifida or deafness.



RHONDA FARAGHER addresses issues surrounding the inclusion of students with special needs into the regular classroom. She discusses potential sources of difficulty with mathematics and suggests strategies to help teachers effectively manage the learning of special needs students in their classes.

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Disability — the functional consequence of an impairment. For example, because of the impairment of short-sightedness, the disability may be that a person is unable to see clearly without glasses.

Handicap — The social or environmental consequences of a disability, for example, inability to follow television news because of deafness. (Foreman, 1996, p. 404f)

Impairment is at the level of diagnosis and is of little assistance to teachers. The functional consequences of the impairment are much more important for us. It is at the level of handicap, though, that we can make a big difference. For example, if the person with a hearing impairment is watching a captioned news service, he or she may have no handicap in the situation. This is an important distinction for teachers. By modifying the learning environment, it may be possible to completely or partially eliminate the social or environmental consequences of the disability.

The teacher who was remembered many years later by my friend saw a disability — slow handwriting, the functional consequence of the impairment of cerebral palsy — and set about reducing the resulting handicap by arranging for her student to learn to type. Situations such as these afford teachers an exciting opportunity. It is an example of an ordinary teacher, seeing an educational need, setting out to meet the need and in the process becoming an extraordinary teacher in the life of a child.

Towards a rationale for inclusion

It can be said that special education has undergone a paradigm shift in the last decade. The WHO definitions provide a hint of the reasons behind this change. Previously, the focus of assisting children with special needs was on identifying the source of the problem and attempting to correct it. The shift has come with changing the focus from the individual to the curriculum (Ainscow, 1994). Whereas once the focus was on the child's deficits, the emphasis of the curriculum view is on changing the educational environment. (Sykes, 1989)

Part of the motivation for the change came from research which suggested that schools which were successful with including students with special needs were successful in meeting the needs of all their community. The same was noted with teachers: 'The evidence seems to support the view that teachers said to be successful in meeting special needs are to a large extent using strategies that help all pupils to experience success. Indeed we are probably referring to the very same teachers.' (Ainscow, 1994, p.24).

As a result of these findings, the UNESCO project 'Special Needs in the Classroom' views the special needs task reconstructed as school improvement. (UNESCO, 1994 and discussed in Ainscow, 1994). In the process of achieving the best possible learning outcomes for the students with special needs, the entire school — students and staff — will benefit.

Certainly entire school improvement is a fairly significant outcome from including students with special needs! However, there are other benefits mentioned in the literature. Some of these are listed below.

- Students with special needs educated in regular classes do better academically and socially than comparable students in noninclusive settings. (Baker, Wang and Walberg, 1994, p. 34)
- When special needs are being met, the learning of all students in the class is enhanced. (Ainscow, 1994, p.24; Goodlad and Hirst, 1990, p.230)
- Schools should mirror society, allowing children the opportunity to 'learn and grow within communities that represent the kind of world they'll live in when they finish school.' (Sapon-Shevin, quoted in O'Neil, 1994, p.7)

To achieve these benefits, the process of inclusion must be well done. Ainscow and Muncey have identified the following features common in schools experiencing success with including students with special needs:

- effective leadership from a headteacher who is committed to meeting the needs of all pupils,
- confidence amongst staff that they can deal with children's individual needs,
- a sense of optimism that all pupils can succeed,

- arrangements for supporting individual members of staff,
- a commitment to provide a broad and balanced range of curriculum experiences for all children, and
- systematic procedures for monitoring and reviewing progress. (Ainscow and Muncey, 1989, cited in Ainscow, 1994)

It has also been shown that preparing the school community for the inclusion of a child with special needs improves the likelihood of a successful outcome. This may involve preparing a written school policy on inclusion, explaining the benefits to other parents (including benefits to the learning of all students and extra resources which may come with the child) and preparing the students (if necessary, explaining unusual behaviour, communication methods and how other students can help).

Resource provision has not been shown to be a key factor in the success of inclusion. Surprisingly, the resourcing issue can be a source of difficulty instead (Ainscow, 1994, p. 20). Indeed, Sykes (1989, p. 102) notes, 'the belief that integration necessarily requires specialized and expensive physical and educational resources is erroneous'.

A related issue concerns the provision of teacher aide assistance for students with special needs. When teacher aides are used effectively, they can assist teachers to support the learning of all children in the class. However, effective practice is not always achieved. Giangreco, Edelman, Luiselli and MacFarland (1997) point out the difficulties which may arise when the teacher aide is seen to be responsible for the instruction and management of the child with special needs. Problems include:

- the child being effectively excluded by working on a separate program, isolated from other students;
- the teacher not being responsible for the teaching program — the learning of the student is not being managed by the professionally trained educator;
- limits on the receipt of competent instruction;
- teacher aides have been observed to over-assist students leading to the development of learned helplessness — the child can also become dependent on the adult;
- interactions with peers in the absence of adults may be prevented (everyone needs time to talk to friends without being overheard!);
- interference with the teaching of other students.

Effective use of teacher aide time can occur when the teacher aide is not viewed as attached to the child with special needs but instead as a resource to assist the teacher to meet the needs of all in the class. Successful strategies include:

- the teacher aide works with a group of students,

including the student with special needs;

- the teacher aide supervises the other students working on previously set material while the class teacher works with the student with special needs, or a small group having difficulties;
- the teacher aide prepares materials for use by the whole class;
- the teacher aide works with the high achieving students in the class, using material planned by the class teacher.

What might be the difficulties with mathematics?

In this section, I will move to consider students with intellectual disabilities — in particular, Down syndrome. Down syndrome is the most common congenital abnormality resulting in intellectual disability, occurring in approximately one in 600 births in Australia. Although a great deal is known about how children with Down syndrome learn, at this stage little is known about the source or extent of the difficulties with mathematics. It can be said with little argument that difficulties may be universal in the population and, for some children, may be profound (Bird & Buckley, 1994).

However, current research is shedding light on this problem (Faragher, 2000b). It has been known for some time that people with Down syndrome can do mathematics (Cruikshank, 1948). While they have difficulty developing their own strategies, when carefully taught, they are able to use strategies such as counting on for addition (Irwin, 1991). What is more, some students in Irwin's study were shown to still be using the strategy in

the following year, without reinforcement from their new teacher.

The source of the difficulties people with Down syndrome face with mathematics is at the heart of what it means to learn, know and do mathematics itself. Mathematicians have often described their field as the study of pattern and doing mathematics to be making conjectures, finding connections and spotting and explaining patterns.

From the literature, it is known that people with Down syndrome experience great difficulty in developing strategies. As a result, much of their learning of mathematics is restricted to learning what appear as unconnected concepts. Compounding their difficulties, it is also known that many people with Down syndrome have restricted working and short-term memory capacity. These two factors combine to make the learning of mathematics difficult for students with Down syndrome (Faragher, 2000b).

Another related problem arises from the difficulty found with developing strategies. It is known from research (and the experiences of many parents) that ordinary children develop a deep sense of number in the preschool years. The new mathematics syllabus being developed in Queensland acknowledges that young children have their own strategies and that these should be encouraged. (Ilsley, 2000). This is an important and laudable development but it does present a significant problem for children with Down syndrome. It is unlikely they will develop strategies on their own and will need to be directly taught effective strategies for performing the mathematics required. This is an important teaching issue and will be considered in the next section.

Some strategies to help

When planning to teach students with Down syndrome, it is important to remember that they can (and do!) learn mathematics. It is also important to realise that there is no 'miracle method'. Good special education is good teaching. As Ainscow (1994, p. 19) notes:

My conclusion now is that no such specialised approaches [special ways of teaching children with special needs to learn successfully] are worthy of consideration. Whilst certain techniques can help particular children gain access to the process of schooling, these are not in themselves the means by which they will experience success.

Directly teach strategies

Mathematics teachers are good at directly teaching strategies! The difficulty lies with deciding which strategies are worth teaching. Careful thought about the purpose of the mathematics, where the topic leads and future needs of the student should inform the decision.

Many students with learning difficulties have an individual education plan (IEP). Strategies to be taught should be noted on the IEP and when performance has been demonstrated, the accomplishment should be recorded. This will allow teachers in the following year to reinforce the strategy rather than interfere with previous learning — a problem noted in Irwin's 1991 study.

Aim for over-learning

An unfortunate characteristic of many children with Down syndrome is the failure to consolidate newly acquired cognitive skills into the repertoire (Wishart, 2000). The technique of over-learning can help students overcome this deficiency. After a student has demonstrated mastery of a particular strategy, further opportunities to practise, reinforce and learn are offered. Frequent revision will also be beneficial.

Use error free learning

Many children with Down syndrome take longer to learn than ordinary children and take longer still to overcome misconceptions they may have developed. The aim of error free (or errorless) learning is to avoid the misconceptions developing in the first place.

Ensure adequate time for learning

More time for mathematics will be needed. Unfortunately, for many children with learning difficulties; less is often the result. Sometimes program planners feel they are being kind by reducing time allocated to a potentially frustrating subject in the mistaken belief that progress will be limited.

Making time within the mathematics program can be achieved by filtering out the unnecessary. Careful and informed decisions will have to be made about the areas which can be omitted without disadvantaging the future progress of the student. (Faragher, 2000a).

Use a calculator

Over twenty years ago, Koller and Mulhern (1977) demonstrated that students with Down syndrome could be taught to use a calculator effectively. There is no excuse for not allowing them to do so.

Help!

So you have found out you are going to be teaching a child with Down syndrome (or another special need which will make learning mathematics difficult) — where to from here? The following suggestions might be helpful.

- Ask the student. Depending on their age, they will be able to tell you how they like to learn, where they have trouble and what they want to learn.
- Ask the child's parents. Parents will not expect you to know a great deal about their child's difficulties but they will expect you to want to know. In recent years, early intervention has been readily available in most places in Australia. Parents have been expected to play a large role in the therapy and learning development of their children. In the process, most learn a great deal about what motivates their child, how they learn best, what will not work and what has been accomplished in previous years. Parents should be seen as an invaluable resource.
- Ask the previous teacher and read the IEP so you know what has been accomplished and what the current aims for learning are.
- Contact your local special school or unit, (in Queensland, the Low Incidence Support Unit of the Department of Education Queensland can assist) or support associations such as the Down Syndrome Association of Queensland.

In conclusion

Working with a student with special needs and learning disabilities in particular presents one of the most rewarding opportunities a teacher can encounter. By attempting to overcome the social and environmental consequences of a disability, the handicap a student experiences in a classroom may be minimised.

This paper has presented a view of education for special needs as one seeking to enhance the learning of all in the school. In mathematics classrooms, some environmental consequences of an intellectual disability result from the nature of the subject itself. Strategies have been suggested to assist teachers to overcome these consequences. Sources of further assistance have also been suggested as no teacher should feel they have to manage on their own.

And finally, a happy ending. My friend's daughter did go to university and has recently completed her degree. May all teachers have the opportunity to make a difference in the life of a child by meeting a special need.

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